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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/608,354	06/29/2000	Donald Hooper	10559/222001/P8715	8914

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EXAMINER

EDELMAN, BRADLEY E

ART UNIT	PAPER NUMBER
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2153

DATE MAILED: 08/05/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/608,354

Applicant(s)

HOOPER, DONALD

Examiner

Bradley Edelman

Art Unit

2153

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 June 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 June 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

This is a first office action on the merits of this application. Claims 1-22 are presented for examination.

Drawings

1. The drawings are objected to because Fig. 3 lacks adequate labels or an adequate legend. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

2. Claim 10 is objected to because of the following informalities: the word "of" on line 15 of the claim appears to be incorrect. It should read "if." Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-5, and 9-17 are rejected under 35 U.S.C. 102(e) as being anticipated by Brown (U.S. Patent No. 6,539,369).

In considering claims 1 and 13, Brown discloses a computer-implemented method and program product for searching a database for a prefix representing a destination address, comprising:

Loading two trees of tables ("[longest match prefix] lookup tables 200a,b") each tree of tables having a large table at a root branching to a small tables (col. 5, lines 46-54; col. 12, lines 35-45; Fig. 2B, Fig. 10A); and

Traversing the two tables of trees in parallel to find a match of an entry to the prefix (col. 1, lines 25-26, illustrating the "longest match prefix lookup table"; col. 12, lines 46-52, "each of the lookup tables 200a-b is searched in parallel with the same search key 210... the final route index 900 is found after a search in parallel of both lookup tables 200a, 200b").

In considering claims 2 and 14, Brown further discloses that an entry comprises a router pointer representing the destination address, and a pointer to a next small table (col. 5, lines 28-29, "the route index 102 is used to access the next hop for the IP destination address"; col. 6, lines 51-54, "each location in the L1 mapper 106a stores a route index 102 assigned to the level-5 node... or an address pointer to the next mapper 106b-c").

In considering claims 3 and 15, Brown further discloses that the small tables comprise:

Prefix match fields for indexed table entries ("bits 502(1) – 502(32)");

A population count of pointers ("route inde[ces]"); and

Hidden prefix entries that hold shorter prefix route entry pointers ("bit-masked value"; col. 23, lines 37-57).

In considering claims 4 and 16, Brown further discloses reporting a non-match if the prefix does not match an entry (col. 16, lines 34-42; col. 17, lines 1-5, "no-entry").

In considering claims 5 and 17, Brown further discloses that a first large table is a single 64K entry table indexed by bits 31:16 of an Internet protocol (IP) address (Fig. 2B, "Mapper Level 1"; col. 7, lines 28-32, "the L1 mapper has 64K possible locations"; col. 6, lines 1-8, "the route indices 102 associated with the first 16-bits of the key 104 [i.e. bits 31:16] are stored in mapper 106a").

In considering claim 9, Brown discloses a computer storage device storing a data structure for managing prefix representation internet protocol (IP) destination addresses, the data structure comprising:

Two trees of tables ("lookup tables 200"), each tree of tables comprising:

A trie block, the trie block including a route pointer and a trie pointer (Figs. 2A, 2B; col. 5, lines 25-29, 46-48; col. 6, lines 51-54); and

A trie information structure, the trie information structure including masks and route entry pointers (col. 23, lines 37-57, "8-bit masked value"; col. 24, lines 10-16, "addresses stored in the pointers field").

In considering claim 10, Brown discloses a computer-implemented method of searching a collection of data comprising:

Searching a first table of trees and a second table of trees ("lookup tables 200") for a received search term, each of the trees of the first and second table containing a trie element and a trie pointer, for a match of the search term with a trie element (col. 12, lines 35-59);

Determining whether a trie pointer is non-null when the trie element matches the search term (col. 16, lines 22-38, "if the entry stores a subtree entry descriptor, a further search in the lookup table is required");

Comparing the trie element in the tree of the first table containing the null pointer with a trie element in the tree of the second table containing the null pointer (col. 16, lines 53-54, 60-67; col. 17, lines 3-4);

Reporting a match if the search term matches the trie element in the first table of trees; and reporting a match if the search term matches the trie element in the second table of trees (col. 17, 1-17, wherein the result is forwarded to the next lookup table).

In considering claim 11, Brown further discloses that the search term is a destination address (col. 5, lines 25-30, "destination address").

In considering claim 12, Brown further discloses that the destination address is a prefix (col. 5, lines 25-30, "longest match prefix lookup").

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 6 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brown.

In considering claims 6 and 18, Brown further teaches that a second large table is a single 256 entry table that is indexed by particular bits of an IP address (col. 8, lines 49-53, "subtree entry 404 provides access to 256 possible route indices 102"). However, Brown does not explicitly state that the particular bits constitute bits 31:24 of the IP address. Nonetheless, the selection of which bits will represent the IP address is arbitrary and a matter of design choice. It would have been obvious for the bits to be the most significant bits, so that the system would not have to skip any portions of the IP address in order to evaluate the 256-entry table.

5. Claims 7, 8, and 19-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brown, in view of Lipman et al. (U.S. Patent No. 6,192,051, hereinafter "Lipman").

In considering claims 7, 8, 19, and 20, although the system taught by Brown discloses substantial features of the claimed invention, it fails to disclose dynamically allocating the small tables, wherein a tree with each node represents 4 bits of addresses covering an extension of 1-4 bits of a prefix entry from a previous tree. Nonetheless, such a feature is well known in the art, as evidenced by Lipman. In a similar art, Lipman discloses a system for IP address lookup using a table of trie entries (col. 9, lines 49-52; col. 10, lines 32-67), including dynamically allocating small tables, wherein a tree with each node represents 8 bits of addresses covering an extension of 1-8 bits of a prefix entry from a previous tree (col. 11, line 61 – col. 12, line 2; Fig. 7, wherein entries are deleted or added, and the level-3 trees each contain 8 extension bits from the previous tree). Thus, it would have been obvious to include this feature in the system taught by Brown, to keep the tables up to date, and it would have further been obvious to a person having ordinary skill in the art to only include 4 bits of addresses, rather than 8, in order to decrease the amount of memory and processing necessary in the system.

In considering claim 21, Lipman further discloses adding and deleting entries (col. 12, lines 1-2).

In considering claim 22, Lipman further discloses that the deleting comprises removing corresponding trie entries, decrementing the population counter, determining

an entry next longest prefix, and inserting the next longest prefix in the trie (col. 10, lines 40-50).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bradley Edelman whose telephone number is (703) 306-3041. The examiner can normally be reached on Monday to Friday from 8:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glen Burgess can be reached on (703) 305-4792. The fax phone numbers for the organization where this application or proceeding is assigned are as follows:

For all After Final papers: (703) 746-7238.

For all other correspondences: (703) 746-7239.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

BE
July 31, 2003



Dung C. Dinh
Primary Examiner